

G22TELG

Galilean Telescope, with a positive and a negative lens

1.Lens The object for the first lens is at negative infinity.

$$\begin{aligned}x_{1o} &:= -10^{10} & f_1 &:= 30 \\ x_{1i} &:= \frac{1}{\left(\frac{1}{f_1}\right) + \frac{1}{x_{1o}}} \\ x_{1i} &= 30\end{aligned}$$

2.Negative Lens

Distance from first lens is a, chosen such that the object for the negative lens is close to the focal length f_n of the negative lens and the image is at - infinity

$$\begin{aligned}x_{ni} &:= 10^{10} & f_n &:= -10 \\ x_{no} &:= \frac{-1}{\frac{1}{f_n} - \frac{1}{x_{ni}}} & x_{no} &= 10\end{aligned}$$

3. Magnification

$$m_1 := \frac{x_{1i}}{x_{1o}} \quad m_1 = -3 \times 10^{-9}$$

$$m_2 := \frac{x_{ni}}{x_{no}} \quad m_2 = 1 \times 10^9$$

$$m_1 \cdot m_2 = -3$$

If we assume that x_{1o} and x_{ni} have about the same value and therefore cancel, we have for x_{1i} about f_1 , and for x_{no} about f_n

$$\frac{f_1}{f_n} = -3$$